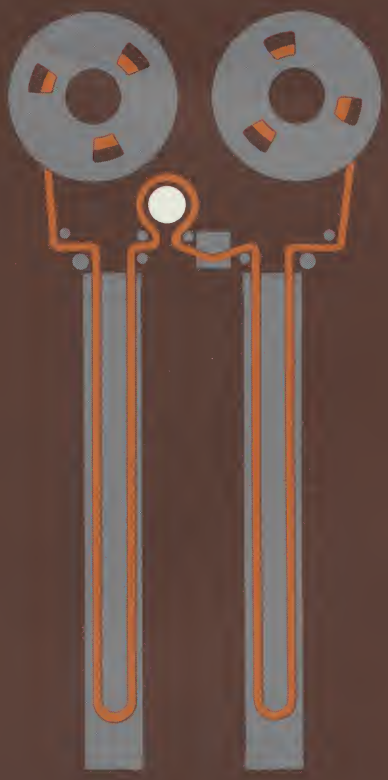
AMPEX

TM-11 DIGITAL TAPE TRANSPORT
TM-11200 TAPE MEMORY SYSTEMS

a new high-speed, single-capstan-drive tape transport with speeds to 120 ips and 7-track or new ASCII 9-track formats—plus tape memory electronics for writing, reading and checking digital data to **800 bpi.**



TM-11 DIGITAL TAPE TRANSPORT
TM-11200 TAPE MEMORY SYSTEMS

The Ampex TM-11/TM-11200 establishes a whole new family of medium to high-speed tape transports and memories. Creating a new "state-of-the-art" for digital transports, the TM-11 meets or exceeds the reliability standards set for today's most advanced computers. With the introduction of the TM-11/TM-11200, the strongest data and equipment reliability in high-speed computers (and associated peripheral equipment) resides in tape memories.

The second member of a new generation of digital tape transports, TM-11 was preceded by the TM-7. This moderate-speed forerunner introduced the revolutionary concept of single-capstan drive – and provided tests and actual operating hours that have established a proven pattern of dependability, low-maintenance and gentle tape handling. The Ampex single-capstan-drive concept NOW PROVIDES in excess of 2,000 hours MTBF and 10^9 start/stop operations before replacement parts are needed in the drive mechanism. In tests with data, 33 data blocks of 1024 bits (all "1's" in IBM format) were recorded at 800 bpi and re-read cyclically. Over 160,000 passes of this one section of tape were made WITHOUT a single bit error!

The basic TM-11 transport is complete – with power supplies, control electronics, optional operator control panel and enclosure. It provides tape speeds to 120 ips, packing densities to 800 bpi. The transport is also "universal"; it can be adapted to a number of computer formats.

The TM-11211 Tape Memory System is a combination of the single-capstan-drive TM-11 transport and control electronics, plus Ampex DE-200 read/write electronics. This compatible mating of advanced transport and stable, reliable and versatile data electronics provides DATA TRANSFER RATES TO 96 KILOBITS/SECOND in the TM-11211 System.

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TM-11 / TM-11200

Advanced features... that set new standards for tape memory performance

- **High MTBF, minimal servicing, no mechanical adjustment**
  The decreased number of components and extreme mechanical simplicity of the TM-11 results in reliability equal to, or exceeding, other computer equipment.

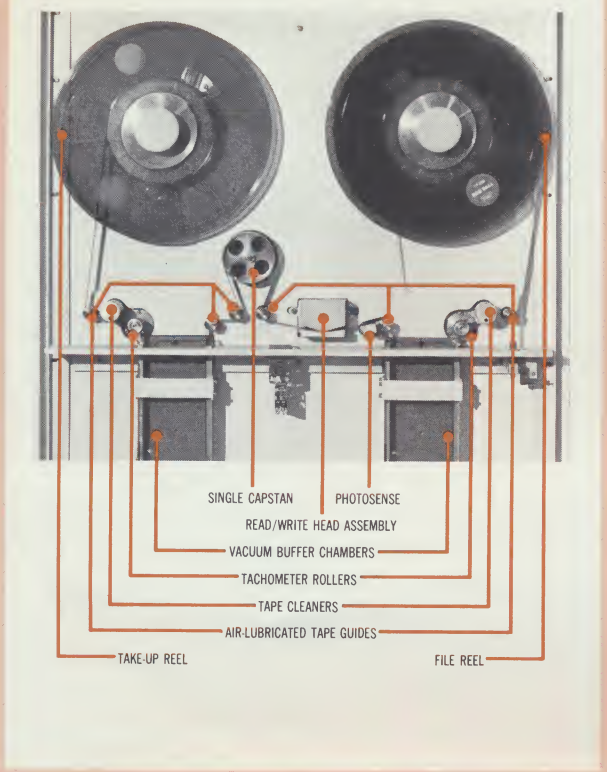
- **Increased data reliability**
  The **only** surfaces in sliding contact with the oxide side of the tape are the read/write head and tape cleaners. Thus, shed material is drastically reduced and dropout errors virtually eliminated.

- **Maximum protection of tapes**
  Controlled-tension tape path and use of air-lubricated guides result in greatly increased life and maximum protection of tapes.

- **Full restriction-free programming**
  Positive control of start/stop cycles (with NO shock transients as induced by pinch rollers and vacuum capstan tape movement devices) results in tape memory programming and operation with no restrictions whatever.

- **Perfect rewind packing assured**
  During rewind on the TM-11, tape is not removed from the vacuum chambers and even, constant tension is always applied to the rewinding tape pack. This assures safe storage of tapes and trouble-free reuse.

- **Compact, flexible packaging**
  The TM-11 transport and TM-11200 systems can be mounted in any standard 24-inch rack arrangement, or in the completely new TM-11/TM-11200 console. These new consoles provide the easiest operator access plus compactness. The TM-11211 system in console cabinet measures only 67" high, 30" wide and 28" deep.



TM-11 TAPE TRANSPORT

TM-11 TAPE DRIVE

In the new Ampex TM-11 tape drive, a revolutionary straight-forward approach has resulted in a tape drive that is ideal for high-speed digital systems. This all-new design utilizes a single capstan and low-friction tape path. The tape is held in contact with the capstan at all times by uniform tension derived from twin vacuum columns, one on each side of the capstan. Tape motion over the read/write head directly follows that of the capstan surface regardless of wide changes in friction properties of the tape or mechanism. The single capstan is servo driven to give uniform and closely controlled performance of tape movement — without being influenced by line voltage or frequency variations.

In the TM-11, there is no "dead time" and no tape velocity overshoot during start/stop transient — allowing the full start/stop time to be utilized for uniform and gentle tape accelerations and decelerations. Start/stop characteristics and nominal tape velocity are held constant regardless of normal environment, line voltage or frequency variations. The tape path permits sliding contact of the tape ONLY with head and tape cleaners. The balance of the tape path consists of: two vacuum chambers, six air-lubricated guides, two tachometer rollers and the single capstan (with no-slip surface). No mechanical adjustments are needed in the tape path.

TM-11211 TAPE MEMORY SYSTEM

The TM-11211 is a complete tape memory system for use with high-speed computers — as on-line or auxiliary tape memory for input and output — or for other digital applications that require high transfer rates. The TM-11211 is designed to write, read and check digital data in IBM computer formats with bit densities to 800 bpi.

DATA ELECTRONICS AND INTERFACE UNIT

All data and logical control signals in the TM-11211 are transferred through the input/output panel directly to the processor. The tape memory system includes the following circuits: detection circuits, skew register, strobe generator and output circuits. Optional features of the interface are vertical parity check, rate check and write echo check. The local data electronics (read/write) unit contains the following circuits: write head deskew, NRZ register, write head drivers, read preamplifiers, read head deskew. Skew correction, peak detection, and parity check are performed by the data electronics.

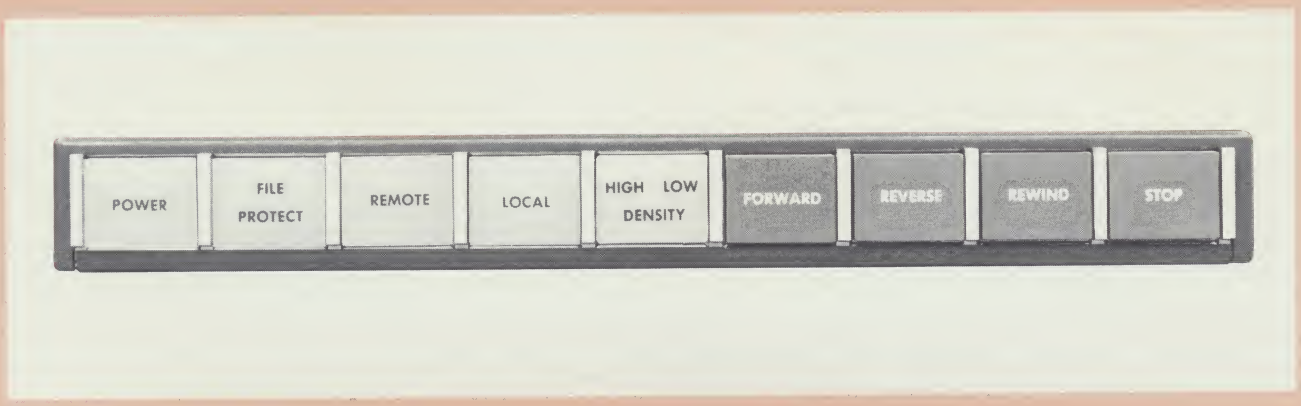
In the data electronics, data lines are fed via level converters into the write input gates. A write strobe pulse, generated by customer equipment, strobes the data at the input gate to allow data entry. The strobed data triggers one-shot delays which compensate for static skew due to head mechanical tolerances.

Data is stored by non-return-to-zero recording. The delayed outputs drive the NRZ register — which in turn controls the write head drivers. The NRZ register is reset for the longitudinal parity check by a "write reset pulse," provided by customer equipment. The write driver power supply is gated with the write permit gate.

Skew corrected read head outputs from the local data electronics (read/write) unit are fed to linear differential amplifiers prior to peak detection. The peak detectors have different clipping levels for the write check and read operations. A higher clipping level is used during the write check operation to overcome the effect of the write-to-read crosstalk and to ensure sufficient amplitude for clipping at a lower level on subsequent reading.

The detected read information enters a skew register. A strobe pulse, derived from the first arriving bit of each character, gates the information out from the interface unit and resets the skew register. The strobe pulse is delayed an interval of one-half frame during the read operation — but is advanced during the write check to establish a more stringent check.

OPERATOR AND REMOTE CONTROL FUNCTIONS



OPERATOR CONTROLS

The TM-11211 operator and remote controls are designed to accept tape input control signals, to provide output control signals and to acknowledge signals to the customer's equipment. All required tape command interlocks are provided to ensure that erroneous command sequences will not cause tape damage or any other system malfunction. Controls also include the logic for Rewind to Load Point, File Protect and other computer oriented functions. An Operator Control Panel is supplied with the unit for local operation and indication. Indicators show the status of the system under both *local* and *remote* command conditions.

POWER SWITCH AND INDICATOR

In the "on" position, the transport and its control logic is activated. In the "off" position, the transport and its control logic is deactivated and all power to the transport is off.

REMOTE SWITCH AND INDICATOR

When this momentary switch is depressed, the remote indicator lights up "white." When in remote, if select to the transport is true, the remote indicator lights up "red." When in remote and when select is true, all input and output lines to the transport are enabled, the local state is reset and the local indicator is turned off.

LOCAL SWITCH AND INDICATOR

When this momentary switch is depressed (and the "transport ready" is true), the transport is conditioned to accept control commands generated by the local switches only. The remote state is reset and remote indicator turned off. When power is first applied, or "transport ready" is false, the transport is automatically set to the local state.

STOP SWITCH

When this momentary contact switch is depressed, the tape is unconditionally stopped, and the transport set to local state.

FORWARD TO LOAD POINT SWITCH

This momentary switch is used in normal operation when a new file reel is mounted. When the switch is depressed, tape is automatically loaded into the vacuum chambers, driven in the forward direction and stopped automatically at the load point. If the tape is already loaded and the switch is then depressed, the tape will be driven in the forward direction. This switch is enabled only in the local state.

REVERSE SWITCH

When this momentary contact switch is depressed, the tape is driven in the reverse direction and stops automatically at the load point. If the tape is at the load point and the switch is depressed, the tape is driven in the reverse direction to the physical beginning of the tape.

REWIND TO LOAD POINT SWITCH

When this momentary switch is depressed, the tape is driven at rewind speed in the reverse direction until it stops automatically at the load point. If the tape is at the load point and the switch is depressed, the command is ignored. This switch is enabled only in the local state.

HIGH/LOW DENSITY SWITCH AND INDICATOR

This switch selects one of two density modes; provisions are made to indicate the mode selected.

FILE PROTECT INDICATOR

When this indicator is illuminated, no writing is permitted on the tape unit. It is on when: (a) no file is mounted, or (b) a file reel is mounted which does not have a write enable ring.

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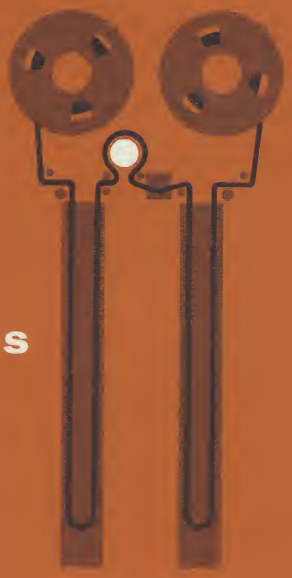
PERFORMANCE CHARACTERISTICS



TM-11 DIGITAL TAPE TRANSPORT

Tape Speed:
75, 112.5, 120 ips (one speed standard, multiple speeds optional)

Tape Width and Thickness:
½ inch width, 1.5-mil by 2400 feet (Ampex Types 832, 838) or 1.0-mil by 3600 feet

Tape Reels:
10½ inch IBM or NAB type

Recording Density:
To 800 bpi

Standard Recording Formats:
(a) 7-track, NRZ, ¾ inch IRG (IBM compatible)
(b) ASCII 9-channel, 0.6 inch IRG (IBM 360 compatible)

Rewind Speed:
120 seconds maximum (for 2400 feet of tape)

Start/Stop Time:
3.8 milliseconds, maximum

Turn-around Time:
7.6 milliseconds, maximum

Instantaneous Speed Variation:

112.5 and 120 ips	±2%
75 ips	±3%

Interchannel Time Displacement (at 120 ips):
3.9 microseconds (with any ½ inch, 1.5-mil tape)

Input Voltage and Frequency:
105–130 VAC, 48 to 62 cps
205–250 VAC, 48 to 62 cps

Operating Environment:
Ambient Temperature –
32° to 100° F, 0° to 38°C
Relative Humidity –
20% to 80% (with no condensation)

TM-11200 TAPE MEMORY SYSTEMS

Packing Densities:
200, 556, 800 bpi (two front panel-selectable densities are standard)

Standard Input and Output Levels:
TRUE —12.0 volts (±2.0 volts)
FALSE 0.0 volts (±1.25 volts)
(Other input and output levels available as an option)

Output Capability:
Output lines can supply 5 ma in either direction at both a logical "zero" or a logical "one." Input impedance is 2000 ohms nominal, 3000 ohms maximum.

Input Functions:

Write Data	Write Permit
Write Strobe	Read Permit
Write Reset	Odd/Even Parity Check (optional)

Output Functions:

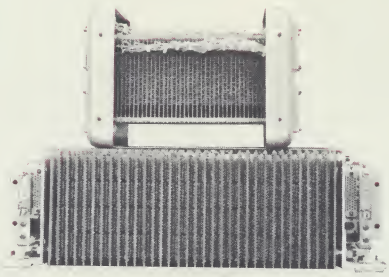
Read Data	High/Low Density
Read Clock	Read Parity Error (optional)

AMPEX reserves the right to change specifications without notice and without obligation.

AMPEX COMPUTER PRODUCTS DIVISION...

equipment for special data handling tasks

TM-7200 Tape Memory System



Core Memory Stacks

RS Core Memory System

The complete line of Ampex computer products includes cores, arrays, stacks, core memory systems, tape transports and tape memory systems . . . products with the speed and reliability to match modern data handling techniques. In addition, Ampex Computer Products Division also provides a unique service to the industry—a service supplying discrete combinations of products to specific data handling/processing requirements.

With a long history of success in solving customers' needs, Ampex Computer Products can provide a whole array of techniques for special data handling tasks. For example, systems often require a combination of tape and core memory. When this occurs, Ampex has the answer. To satisfy your integrated subsystem requirements, contact Ampex *first*. Engineering sales representatives are available at the following Ampex district sales offices.

STRATEGICALLY LOCATED SALES OFFICES OFFER AMPEX CUSTOMERS IMMEDIATE SERVICE

ALBUQUERQUE, NEW MEXICO
414 San Mateo Boulevard N.E.
265-8507 TWX 505-243-9520

ATLANTA, GEORGIA
3376 Peachtree Road N.E.
231-3480 TWX 404-231-1637

CAPE KENNEDY
1980 North Atlantic Avenue
Cocoa Beach, Florida
783-1811 TWX 305-783-1738

BOSTON AREA
235 Bear Hill Road
Waltham 54, Massachusetts
TWinbrook 9-2040 TWX 710-324-0364

CHICAGO AREA
2-N-575 York Road
Elmhurst, Illinois
TErrace 3-8500 TWX 910-254-1429

DALLAS, TEXAS
2626 West Mockingbird Lane
FLeetwood 7-0481 TWX 214-899-9001

DAYTON, OHIO
333 West First Street
BAldwin 8-5117 TWX 513-944-0024

HOUSTON, TEXAS
6001 Gulf Freeway
WAlnut 8-3741 TWX 713-571-1494

HUNTSVILLE, ALABAMA
3322 South Memorial Parkway
881-4271 TWX 205-881-0776

LOS ANGELES, CALIFORNIA
8467 Beverly Boulevard
OLive 3-1610 TWX 213-655-6535

MINNEAPOLIS, MINNESOTA
4010 West 65th Street
WAlnut 7-5638 TWX 910-576-2806

NEW YORK AREA
600 East Palisade Avenue
Englewood Cliffs, New Jersey
567-7800 TWX 201-567-0593
(In New York phone 736-6116)

PHILADELPHIA AREA
947 York Road
Abington, Pennsylvania
TUrner 7-7650 TWX 215-884-2822

SAN FRANCISCO AREA
2220 Bay Road
Redwood City, California
EMerson 7-3861 TWX 415-364-9034

SEATTLE, WASHINGTON
8434 Rainier Avenue South
PArkway 3-3170 TWX 206-998-0914

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AMPEX CORPORATION
COMPUTER PRODUCTS DIVISION
9937 W. Jefferson Boulevard • Culver City • California • 90230

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